

On a new Subclass of Fossil Birds (Odontornithes).

By O. C. MARSH.

The remarkable extinct birds with biconcave vertebræ (*Ichthyornidæ*), recently described by the writer from the upper Cretaceous shale of Kansas *, prove on further investigation to possess some additional characters, which separate them still more widely from all known recent and fossil forms. The type species of this group, *Ichthyornis dispar*, Marsh, had well-developed teeth in both jaws. These teeth were quite numerous and implanted in distinct sockets; they were small, compressed, and pointed, and all of those preserved are similar. Those in the lower jaws number about twenty in each ramus, and are all more or less inclined backward. The series extends over the entire upper margin of the dentary bone, the front tooth being very near the extremity. The maxillary teeth appear to have been equally numerous, and essentially the same as those in the mandible.

The skull was of moderate size, and the eyes were placed well forward. The lower jaws are long and slender, and the rami were not closely united at the symphysis; they are abruptly truncated just behind the articulation for the quadrate. This extremity, and especially its articulation, is very similar to that in some recent aquatic birds. The jaws were apparently not encased in a horny sheath.

The scapular arch, and the bones of the wings and legs, all conform closely to the true ornithic type. The sternum has a prominent keel, and elongated grooves for the expanded coracoids. The wings were large in proportion to the legs; and the humerus had an extended radial crest. The metacarpals are united, as in ordinary birds. The bones of the posterior extremities resemble those in swimming birds. The vertebræ were all biconcave, the concavities at each end of the centra being distinct and nearly alike. Whether the tail was elongated cannot at present be determined; but the last vertebra of the sacrum was unusually large.

This bird was fully adult, and about as large as a pigeon. With the exception of the skull, the bones do not appear to have been pneumatic, although most of them are hollow. The species was carnivorous, and probably aquatic.

When the remains of this species were first described, the portions of lower jaws found with them were regarded by the writer as reptilian †; the possibility of their forming part of the same skeleton, although considered at the time, was not deemed sufficiently strong to be placed on record. On subsequently removing the surrounding shale, the skull and additional portions of both jaws were brought to light, so that there cannot now be a reasonable doubt that all are parts of the same bird. The possession of teeth and biconcave vertebræ, although the rest of the skeleton is entirely avian in type, obviously implies that these remains cannot be placed in the present

* Amer. Journ. of Sci. and Arts, vol. iv. p. 344, Oct. 1872, and vol. v. p. 74, Jan. 1873. 'Annals,' Jan. 1873, p. 80.

† Amer. Journ. of Sci. and Arts, vol. iv. p. 406, Nov. 1872.

groups of birds ; and hence a new subclass, *Odontornithes*, is proposed for them. The order may be called *Ichthyornithes*.

The species lately described by the writer as *Ichthyornis celer* also had biconcave vertebræ and probably teeth. It proves to be generically distinct from the type species of this group, and hence may be named *Apatornis celer*, Marsh. It was about the same size as *Ichthyornis dispar*, but of more slender proportions. The geological horizon of both species was essentially the same. The only remains of them at present known are in the museum of Yale College.

The fortunate discovery of these interesting fossils is an important gain to palæontology, and does much to break down the old distinctions between Birds and Reptiles, which the *Archæopteryx* has so materially diminished. It is quite probable that that bird, likewise, had teeth and biconcave vertebræ, with its free metacarpals and elongated tail.—*Amer. Journ. of Science and Arts*, vol. v., Feb. 1873.

On two new Free Sponges from Singapore.

By Dr. J. E. GRAY, F.R.S. &c.

Dr. A. B. Meyer has sent to the British Museum five specimens of free sponges (four of them belonging to one species, and the other to a separate one), which I believe were obtained in the neighbourhood of Singapore.

The one is very like *Tetilla polyura* of O. Schmidt ('Spongienfauna des atlantischen Meeres,' t. vi. f. 8), which is the type of my genus *Lophiurella*, but differs from it in several particulars ; and the other is a form which has not hitherto occurred to me.

It has been thought that these free sponges are only the young and free state of sponges which become attached in their older state ; but this theory wants further confirmation. *Tetilla polyura* of Schmidt might be young, as it is only $\frac{1}{3}$ inch long ; but the specimens from Singapore are more than 2 inches in diameter and length.

The four specimens, which I have called *Psetalia globulosa*, exhibit four different states of growth, the sponge being considerably modified in its general form as it enlarges.

The youngest specimen, about $\frac{1}{3}$ inch in diameter, is half-oblong, with a few conical projections on the lower part, each ending in a tuft of spicules, and with a flattened upper surface having a small central opening leading to the inner surface.

In a larger specimen, about $1\frac{1}{2}$ inch in diameter, the conical prominences on the under surface, each ending in a tuft of elongate spicules, are more numerous, and the upper surface is produced, conical, and ending in a much larger central opening.

In the largest specimen, about $2\frac{1}{2}$ inches in diameter, the sponge is irregularly conical below, the surface being covered with distinct, rather prominent, tubercles, each containing a tuft of elongate filamentous spicules, ending below, as in the other specimens, in three or more recurved anchoring spines. The upper surface is deeply concave, with only a broad convex margin, incurved, edging the concavity. This, like that of the interior of the other specimens,